END SEMESTER EXAMINATION MAY-2023

Course Name: - B.Tech **Semester:- IV**

Paper Name: - Operating Systems **Paper Code:- TCS-401**

Time - 3 Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. **Max Marks-70**

समय– 3 घण्टे + 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं सह लेखक परीक्षार्थियों के लिए। अधिकतम अंक–70

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries 3 mark. All questions are compulsory.
- Section B- Answer any 5 out of 7 given questions in maximum hundred (150) words. Each question carries 7 marks.
- Section C- Answer any 2 out of 3 given questions in maximum five hundred (500) words. Each question carries 10 marks.

निर्देश:

- प्रश्न पत्र में तीन खण्ड अ, ब, व स हैं। सभी खण्ड अनिवार्य हैं।
- खण्ड–अ में प्रत्येक प्रश्न तीन अंक का है। सभी प्रश्न अनिवार्य हैं।
- खण्ड–ब में छः प्रश्नों में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें। प्रत्येक प्रश्न सात अंक का है।
- खण्ड–स में तीन प्रश्नों में से किन्हीं दो प्रश्नों के उत्तर अधिकतम (300) शब्दों में दें। प्रत्येक प्रश्न 10 अंक का है।

Section – A (खण्ड–अ)

Objective Questions(वस्तुनिष्ठ प्रश्न)

1. Answer all the following questions. 5×3 =15

निम्नलिखित सभी प्रश्न अनिवार्य हैं।

i) Which component of the operating system manages the execution of programs and provides essential services?
   a) Kernel
   b) Shell
   c) Compiler
   d) Debugger

ii) What is the purpose of an interrupt in an operating system?
   a) To terminate a program
   b) To initiate a program
   c) To suspend a program temporarily
   d) To request attention from the CPU

iii) What is the function of the swap space in virtual memory management?
   a) It provides additional RAM to the system
   b) It stores the operating system files
   c) It temporarily holds the process control blocks
   d) It moves pages in and out of main memory

iv) What is the main advantage of multiprogramming in operating systems?
   a) Improved system security
   b) Increased resource utilization
   c) Enhanced user interface
   d) Reduced disk space usage

v) Which of the following is an example of a real-time operating system (RTOS)?
   a) Windows 10
   b) macOS
   c) Linux
   d) VxWorks

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Section – B (खण्ड–ब)

Short Answer Questions (लघुउत्तरीय प्रश्न)

2. Answer any five of the following questions in maximum 150 words. **5×7=35**
निम्नलिखित में से किन्हीं पाँच प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें।

i. Explain the concept of multilevel queue scheduling and how it can be implemented in practice.

ii. What is IPC, and why is it important in concurrent programming? What is a race condition in concurrent programming? How can it be prevented or resolved?

iii. Explain the concept of mutual exclusion in synchronization. How is it achieved using locks or semaphores?

iv. Explain the concept of a semaphore and how it can be used for synchronization between processes.

v. What are the main goals of memory management techniques, such as paging and segmentation? Compare and contrast the working set model and the demand paging model.

vi. What is a page fault? How is it handled in a memory management system? Discuss the role of page replacement algorithms in memory management.

vii. Explain in detail about the Process Control Block (PCB) scheduling.

Section – C (खण्ड–स)

Descriptive Questions (विवरणात्मक प्रश्न)

3. Answer any two of the following question in maximum 300 words. **2×10=20**
निम्नलिखित में से किन्हीं दो प्रश्नों के उत्तर अधिकतम 300 शब्दों में दें।

i) **(a)** Explain the relationship between processes and threads. Can a process exist without threads?
(b) Consider three CPU-intensive processes, which require 10, 20 and 30 time units and arrive at times 0, 2 and 6, respectively. How many context switches are needed if the operating system implements a shortest remaining time first scheduling algorithm? Do not count the context switches at time zero and at the end.

ii) **(a)** Discuss the priority scheduling algorithm and how it handles processes with different priorities.
(b) Consider the following CPU processes with arrival times (in ms) and length of CPU bursts (in ms) except for process P4 as given below:

Process	Arrival Time	Burst Time
P1	0	5
P2	1	1
P3	3	3
P4	4	x

If the average waiting time across all processes is 2 ms and pre-emptive shortest remaining time first scheduling algorithm is used to schedule the processes, then find the value of x?

iii) **(a)** What is a deadlock? Discuss the necessary conditions for deadlock occurrence and methods to prevent or recover from deadlock.
(b) Explain in detail about the Threads and their management.

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